



# BioSENSE

## ONLINE VOC SENSOR

PROCESS TECHNOLOGIES

BIOGAS UPGRADING



**MINIMIZE YOUR HIDDEN COSTS  
FOR CONTAMINATED BIOGAS**

# THE IMPORTANCE OF MANAGING YOUR BIOGAS QUALITY

The important focus on carbon footprint reduction, and the utilisation of waste as green energy, is pushing requirements for the equipment & technologies involved. Our vision is to help you achieve an efficient, eco-friendly biogas plant operation, by providing leading-edge sustainable gas solutions.

Nowadays biogas goes beyond the digestion of energy crops and manure. The increased utilisation of bio-waste is resulting in raw biogas containing previously disregarded impurities such as volatile organic compounds (VOCs). These contaminants, predominately terpenes and ketones, not only endanger the pipe integrity of the gas grid, they can also impact the odorization of the gas, leading to safety issues when gas leakages cannot be detected (smelled) anymore.

## Your key to profitable biogas upgrading is a cost-efficient raw biogas pre-treatment

Pentair's BioSENSE is a new and unique sensor with which the VOC load of biogas can be continuously determined by means of optical absorption spectroscopy. BioSENSE has been developed together with Camlin Technologies and provides a robust cost-effective way of measuring the contaminants before and after pre-treatment of the raw biogas. This also includes the detection of H<sub>2</sub>S and NH<sub>3</sub> breakthroughs to the purified raw biogas in case of saturated activated carbon filter fillings. Your overall plant operation is optimized and the costs for biogas purification are minimized.

## BioSENSE Advantages

- Developed specifically for the application
- Unparalleled in robustness, reliability and operability

## Typical Applications

- Agricultural plants with bio-waste as co-digestate
- Bio-waste treatment plants (industrial, supermarket & residential sources)
- Anaerobic digesters on waste water treatment plants

## Added Value

- Reduce operational costs for activated carbon by up to 30%
- Increase uptime by 1-2%
- Safeguard membrane performance and service life
- Reduce biomethane production costs by 3-5%



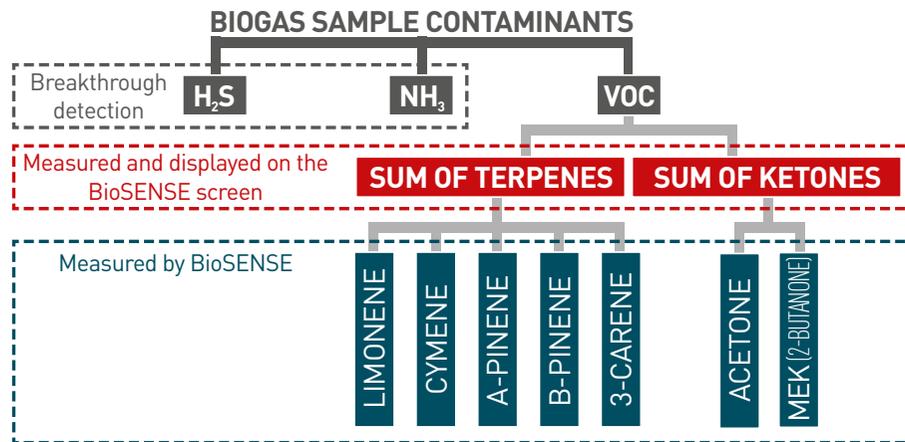
## ABOUT PENTAIR

Pentair ([pentair.com](http://pentair.com)) delivers industry-leading products, services, and solutions for its customers' diverse needs in water and other fluids, thermal management, and equipment protection. With 2016 revenues of \$6.4 billion, Pentair employs approximately 19,000 people worldwide. Pentair proven products and technologies are used in the brewing, soft drink, wine, distillery, bioethanol, and biogas industries. Whether you need a standard-size system or custom-designed solution, Pentair manufactures and commissions components and standardized solutions.

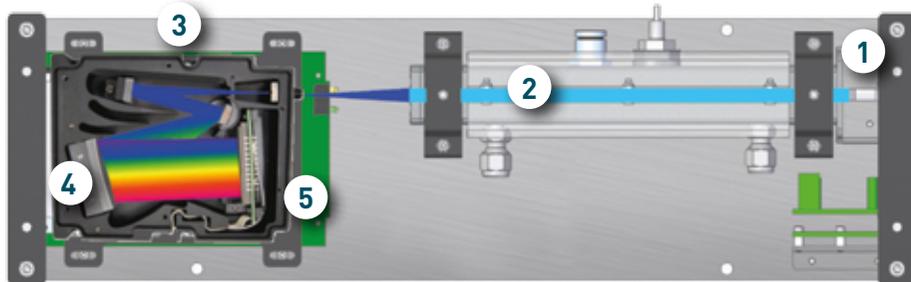
# OPTICAL ABSORPTION SPECTROSCOPY



# BioSENSE TECHNOLOGY



## Process of optical absorption spectroscopy



The optical absorption spectroscopy used in the BioSENSE operates with a UV light source **1** which emits light that penetrates a gas sample in a measuring cell **2**. Here light is partially absorbed by the gas molecules. Since each molecule has its own typical absorption spectrum, it is possible to simultaneously determine the concentration of different components of the gas. The remaining light is captured by the receiver **3**. The receiver splits the light into narrow wavelength bands using an optical grating **4**. Finally the light is captured by a CCD **5** and transformed into an electrical signal for processing. By adapting spectrometric technology to the analysis of biogas, its typical contaminants like VOCs, H<sub>2</sub>S and NH<sub>3</sub>, can be continuously monitored.

## Key Parameters

Specifically designed to measure contaminants in biogas:

- Sum of Terpenes
- Sum of Ketones
- H<sub>2</sub>S (breakthrough detection)
- NH<sub>3</sub> (breakthrough detection)

## Automatic Sampling System

- Up to 5 different sampling points
- Up to 6 measurements per hour

## Technical Advantages

- Purpose-made for the application
- Delivers accurate, reliable and validated results
- Robust (light source and sensor not in contact with gas sample)
- Easy operation without expert knowledge
- Low maintenance
  - No need for calibration gas
  - No on-site calibration
  - Only one inspection service per year



**COMMERCIAL  
BENEFITS**

# BioSENSE = CREATING VALUE FOR YOU

BioSENSE was developed with the aim of improving your plant performance. Pentair's BioSENSE will keep your downtime and raw biogas pre-treatment costs under control.

Following a 72 week field test involving 3 customers, the benefits of BioSENSE were demonstrated with following results:



BioSENSE display showing "Total Ketones and Total Terpenes"

## Reduce Operational Costs for Activated Carbon by up to 30 %



Ketones and terpenes are usually removed by activated carbon filters. Measuring VOCs with the BioSENSE before and after the biogas pre-treatment system provides you several options for minimizing expenses for activated carbon:

- Precise determination of when the activated carbon filling of the filter reaches saturation and needs replacement; the amount of activated carbon being wasted is minimized.
- Comparison of different types of activated carbon in regard with purification and cost efficiency; the best suitable activated carbon can be selected for the prevailing feedstock.
- Identification of substrates causing extraordinarily high contamination levels in the raw biogas; these substrates can be diverted directly to composting or the biogas can be combusted in a CHP.

Cost savings on activated carbon of more than 30 % were achieved in the field test.

## Increase Uptime by 1 to 2 %

When the activated carbon filling of a VOC filter is not replaced in time and a breakthrough of contaminants is only detected by inefficient upgrading performance, the required shutdown will cause production losses. Having installed the BioSENSE online sensor, the plants in the field test managed to increase their revenue from grid injection by 1 to 2 %.

## Safeguard Membrane Performance and Service Life

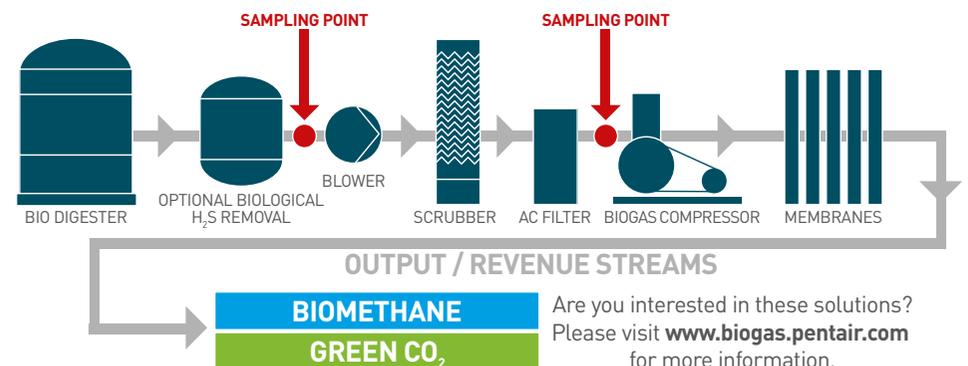
The membranes are the costly and sensitive heart of a biogas upgrading system. When contaminants are not removed, the membranes lose their efficiency and might eventually be damaged. The BioSENSE protects you against inefficient biogas upgrading and unplanned membrane replacements.

## Reduce Biomethane Production Cost by 3 to 5 %

Selecting the right feedstock, reducing the cost for activated carbon, minimizing downtime and avoiding the rejection of biomethane at the gatekeeper, has improved the overall economic yield of the feedstock of the plants in the field test by 3 to 5 %.

## Excellent Return on Investment

Dependent on the size of the biogas upgrading plant, the feedstock and the resulting amount of raw biogas contaminants, the BioSENSE payback period can be as little as one year or less.





**HAFFMANS BV**

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